UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/786,187	02/25/2004	Ping-Hsu Chen	67,200-1070	3693

7590 11/14/2005

TUNG & ASSOCIATES
Suite 120
838 W. Long Lake Road
Bloomfield Hills, MI 48302

EXAMINER	
NOVACEK, CHRISTY L	

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 11/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/786,187	CHEN ET AL.	
	Examiner	Art Unit	
	Christy L. Novacek	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 September 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to the amendment filed September 6, 2005.

Response to Amendment

The amendment to the specification is sufficient to overcome the objection to the specification stated in the previous office action. Therefore, this objection is withdrawn.

The amendment of claim 9 is sufficient to overcome the objection to claim 9 stated in the previous office action. Therefore, this objection is withdrawn.

Claim Objections

Claim 1 is objected to because of the following informalities: In line 4 of claim 1, the phrase "alignment marks" should be deleted. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 9 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Livengood et al. (US 5,952,247, previously cited).

Regarding claim 1, Livengood discloses a substrate having at least one transparent dielectric layer (silicon oxide) overlying alignment marks and an opaque layer overlying the transparent dielectric layer. Livengood discloses providing a focused ion beam (FIB), exposing rendering visible the alignment marks (35) by impinging the FIB against the opaque layer (40) to obliterate the opaque layer overlaying the alignment marks and leaving at least a portion of the transparent layer intact over the alignment marks (Fig. 3d-3h; col. 5, ln. 62 – col. 11, ln. 20).

Regarding claim 9, Livengood discloses a substrate having at least one transparent dielectric layer (silicon oxide) overlying alignment marks and an opaque layer overlying the transparent dielectric layer. Livengood discloses providing a focused ion beam (FIB), cutting an exposure opening in the opaque layer to render the alignment marks visible by impinging the FIB against the opaque layer and leaving at least a portion of the transparent layer intact over the alignment marks (Fig. 3d-3h; col. 5, ln. 62 – col. 11, ln. 20).

Regarding claim 16, Livengood discloses exposing alignment marks on a substrate having a transparent dielectric layer (47) overlying the alignment marks and an opaque layer overlying the dielectric layer, providing a focused ion beam and cutting an exposure opening in the opaque layer to the dielectric layer to render visible the alignment marks by impinging the focused ion beam against the opaque layer, leaving at least a portion of the transparent layer intact over the alignment marks, and viewing the alignment marks through the exposure opening and the dielectric layer (Fig. 3d-3h; col. 5, ln. 62 – col. 11, ln. 20).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 2, 5, 10, 13, 17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Livengood et al. (US 5,952,247) in view of Mizumura et al. (US 5,825,035, previously cited).

Regarding claims 2, 5, 10, 13, 17 and 19, Livengood discloses using a focused ion beam to etch the opaque silicon substrate, but does not disclose the type of ions used in the FIB etch. Mizumura discloses that a FIB system using argon (a noble gas) ions can successfully be used to

process a silicon substrate without contamination (col. 4, ln. 22-28; col. 27, ln. 41 – col. 28, ln. 36). At the time of the invention, it would have been obvious to one of ordinary skill in the art to use an FIB system with an argon ion source to etch the silicon substrate of Livengood because Livengood does not disclose using any particular ion source and Mizumura teaches that an ion source of argon can successfully process a silicon substrate without contamination.

Claims 3, 11 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Livengood et al. (US 5,952,247) in view of Lee et al. (US 6,251,782, previously cited).

Regarding claims 3, 11 and 18, Livengood discloses using a focused ion beam to etch the opaque silicon substrate but does not disclose the current density of the FIB etch. Lee discloses that a FIB system having a current density of 672 pA can successfully etch silicon (col. 6, ln. 19-33). At the time of the invention, it would have been obvious to one of ordinary skill in the art to FIB etch the silicon of Livengood using a current density of 672 pA because Livengood does not disclose using any particular current density and Lee teaches that a current density of 672 pA can successfully etch silicon.

Claims 4, 7, 8, 12 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Livengood et al. (US 5,952,247) in view of Lee et al. (US 6,251,782) as applied to claim 3 and 11 above, and further in view of Mizumura et al. (US 5,825,035).

Regarding claims 4, 7, 8, 12 and 15, Livengood discloses using a focused ion beam to etch the opaque silicon substrate, but does not disclose the type of ions used in the FIB etch. Mizumura discloses that a FIB system using argon (a noble gas) ions can successfully be used to process a silicon substrate without contamination (col. 4, ln. 22-28; col. 27, ln. 41 – col. 28, ln.

36). At the time of the invention, it would have been obvious to one of ordinary skill in the art to use an FIB system with an argon ion source to etch the silicon substrate of Livengood because Livengood does not disclose using any particular ion source and Mizumura teaches that an ion source of argon can successfully process a silicon substrate without contamination.

Claims 6, 14 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Livengood et al. (US 5,952,247) in view of Mizumura et al. (US 5,825,035) as applied to claims 2, 13 and 19 above, and further in view of Lee et al. (US 6,251,782).

Regarding claims 6, 14 and 20, Livengood discloses using a focused ion beam to etch the opaque silicon substrate but does not disclose the current density of the FIB etch. Lee discloses that a FIB system having a current density of 672 pA can successfully etch silicon (col. 6, ln. 19-33). At the time of the invention, it would have been obvious to one of ordinary skill in the art to FIB etch the silicon of Livengood using a current density of 672 pA because Livengood does not disclose using any particular current density and Lee teaches that a current density of 672 pA can successfully etch silicon.

Response to Arguments

Applicant's arguments filed September 6, 2005 have been fully considered but they are not persuasive.

Regarding the rejection of claims 1, 9 and 16 as being anticipated by Livengood, Applicant argues that Livengood allegedly fails to disclose leaving at least a portion of the transparent layer intact over the alignment marks. Lines 32-37 of column 6 of Livengood state, "The gas-assisted laser etching system uses an etch chemistry having a high selectivity of silicon

over silicon dioxide. In this manner, after etching the silicon substrate from alignment hole regions 34 through the bottom of chip 40, **the system stops at the silicon-silicon dioxide interface at the top of chip 40**." (emphasis added). Lines 21-24 of column 7 of Livengood state, "Once the silicon substrate has been removed from alignment hole 34 of chip 40, M1 chip fiducial 35 can be viewed **through** the transparent silicon dioxide film **separating** M1 from the silicon substrate." (emphasis added). Hence, it is clear that Livengood discloses etching through the opaque layer (the substrate) and stopping the etching upon reaching the transparent layer (the silicon dioxide layer) and that the silicon dioxide layer remains intact over the alignment marks. Therefore, these rejections are maintained.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christy L. Novacek whose telephone number is (571) 272-1839. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CLN
November 8, 2005

Michael Trinh
Primary Examiner